NC State University

Department of Electrical and Computer Engineering

ECE 463/563: Fall 2018 (Rotenberg)

Project #2: Branch Prediction

by

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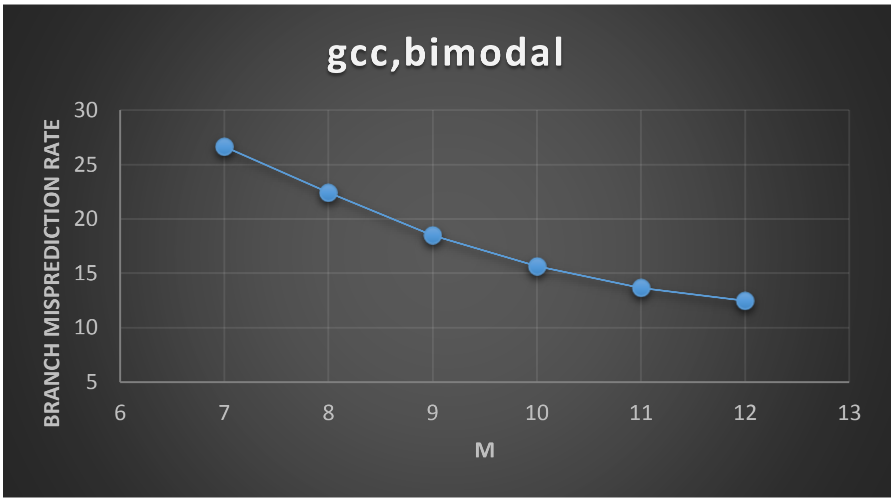
NCSU Honor Pledge: "I have neither given nor received unauthorized aid on this test or assignment."

Student's electronic signature: _Emil Prisquilas Peter______________________________
(sign by typing your name)

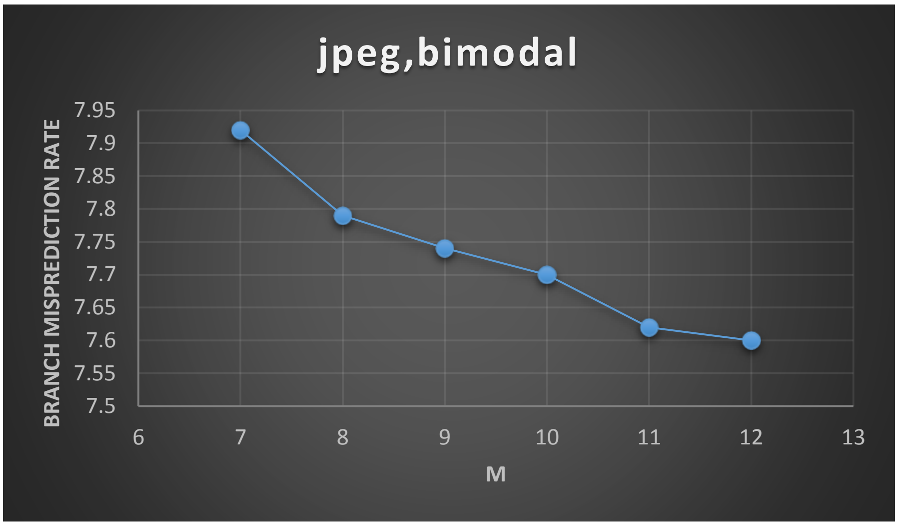
Course number: ______563_____________
(463 or 563 ?)

Part 1: Bimodal Predictor

Graph for gcc benchmark:



Graph for jpeg benchmark:



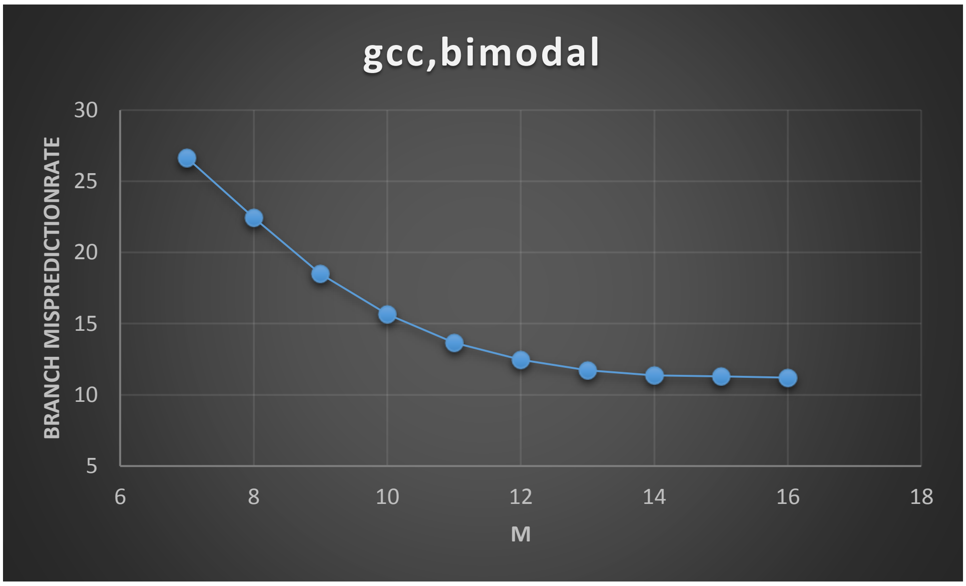
Graph for perl benchmark:

Analysis:

- The value of misprediction rate decreases for increase in the value of m for all three benchmarks, since as the number of bits in the index increases, the number of unique branches that can be accommodated in the bimodal predictor table increases, leading to les mispredictions.
- The difference in the misprediction rates for successive values of m is less in jpeg compared to perl and gcc benchmarks.
- The misprediction rate is maximum for gcc benchmark for different values of m compared to the otherc two benchmarks.
- The predictor performs the best for jpeg benchmark since mispredition rate for jpeg is less for different values of m compared to perl and gcc benchmarks.

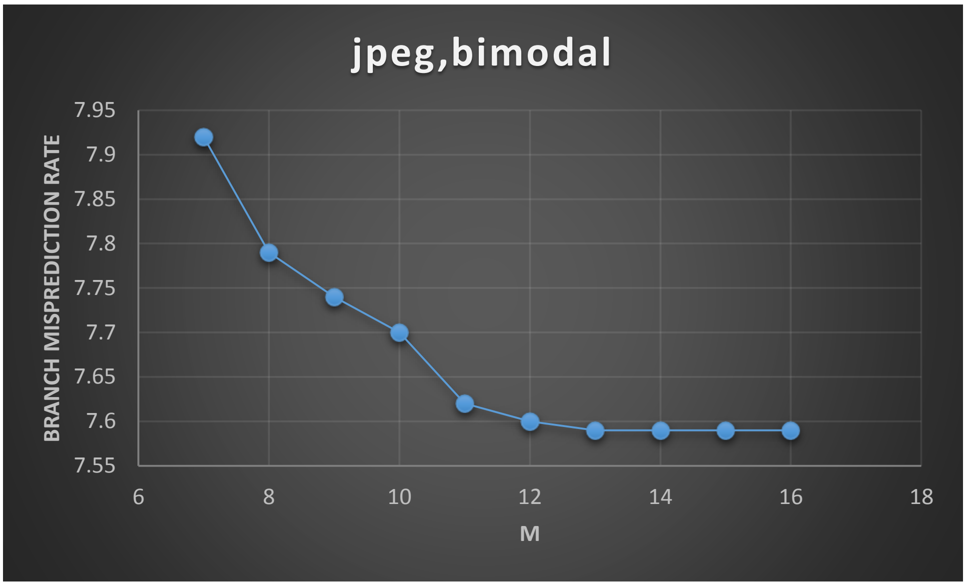
Design:

For gcc benchmark:



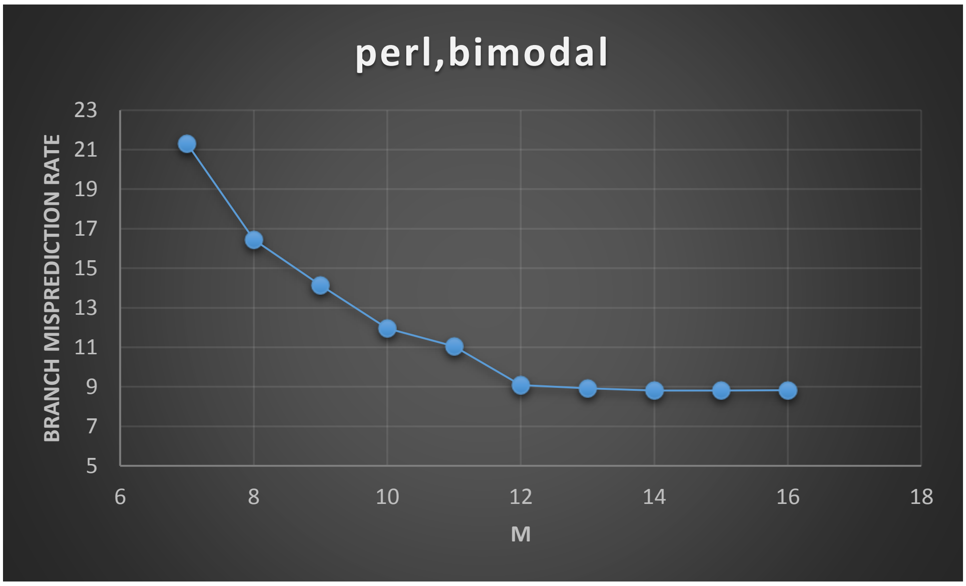
The design which minimizes the misprediction rate and predictor cost occurs for m=14, since we observe diminishing returns in the misprediction rate for any increase in the value of m beyond m=14. At m,
Misprediction rate =**11.37%**
Predictor storage=**4KB**

For jpeg benchmark,



The design which minimizes the misprediction rate and predictor cost occurs for m=13, since we observe diminishing returns in the misprediction rate for any increase in the value of m beyond m=12. At m,
Misprediction rate =**7.6%**
Predictor storage=**1KB**

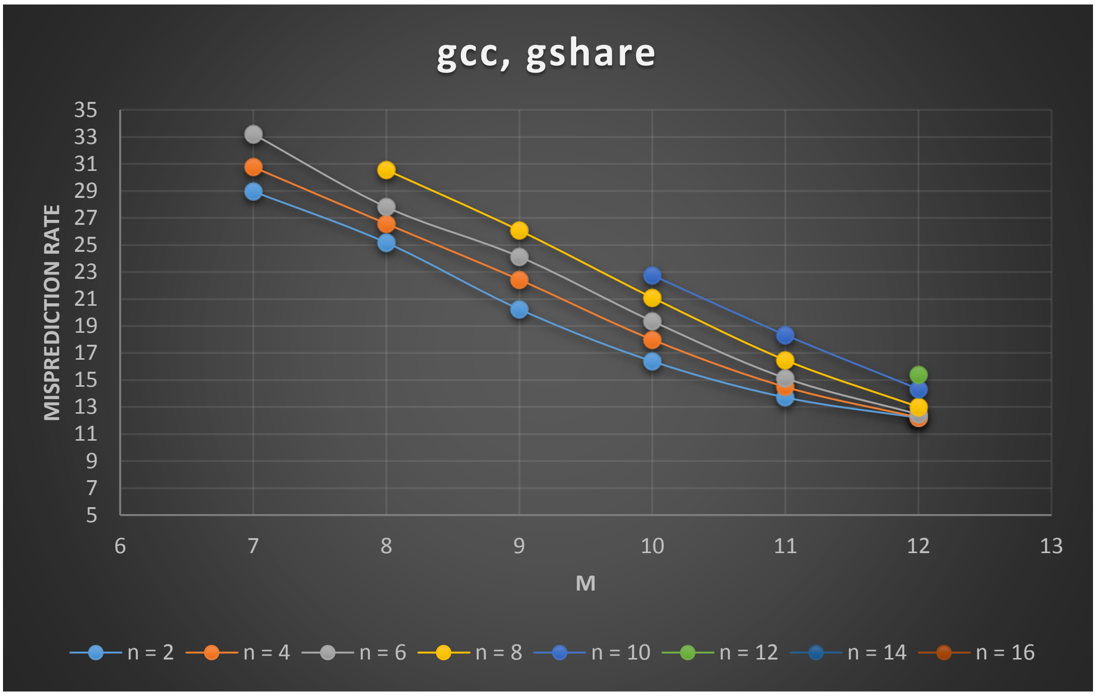
For perl benchmark,



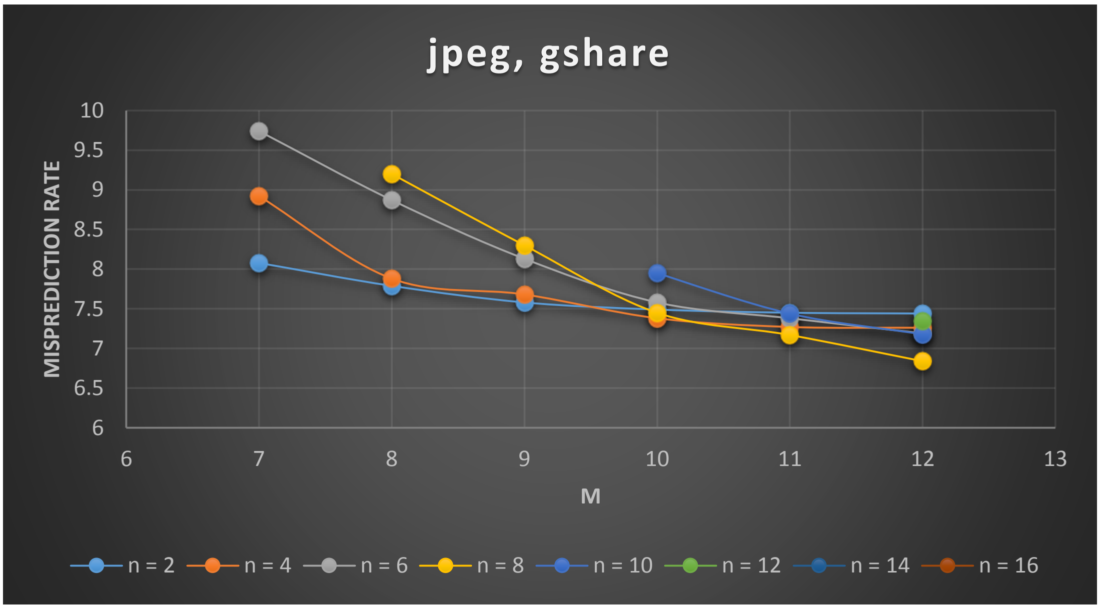
The design which minimizes the misprediction rate and predictor cost occurs for m=12, since we observe diminishing returns in the misprediction rate for any increase in the value of m beyond m=12. At m,
Misprediction rate =**9.09%**
Predictor storage=**1KB**

Part 2:Gshare predictor:

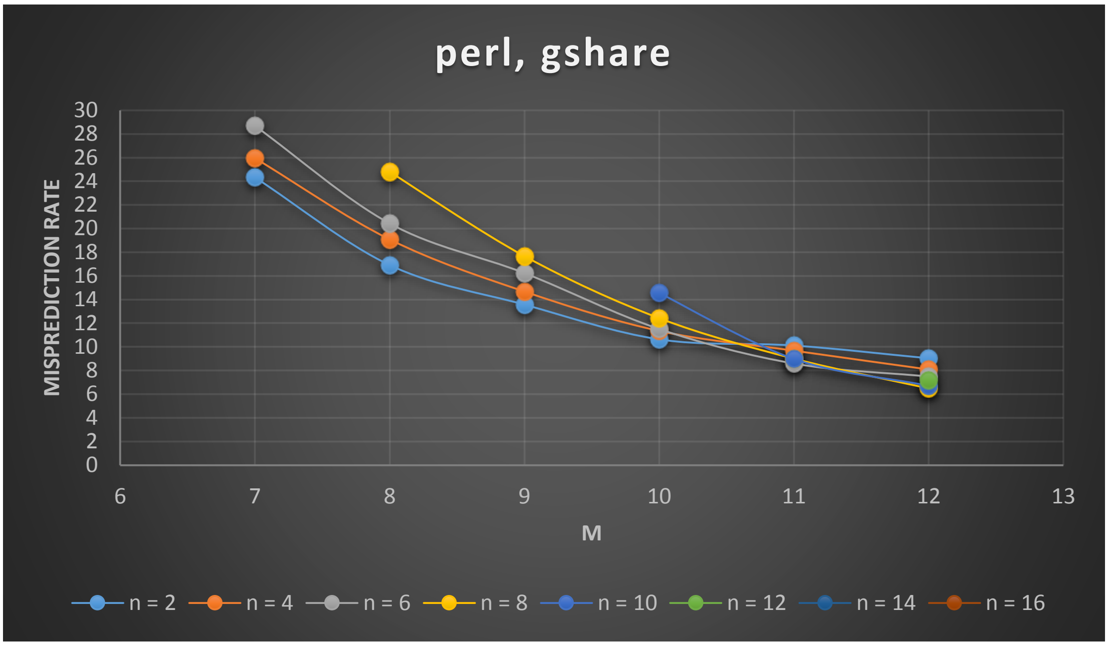
Graph for gcc benchmark:



Graph for jpeg benchmark:



Graph for perl benchmark:

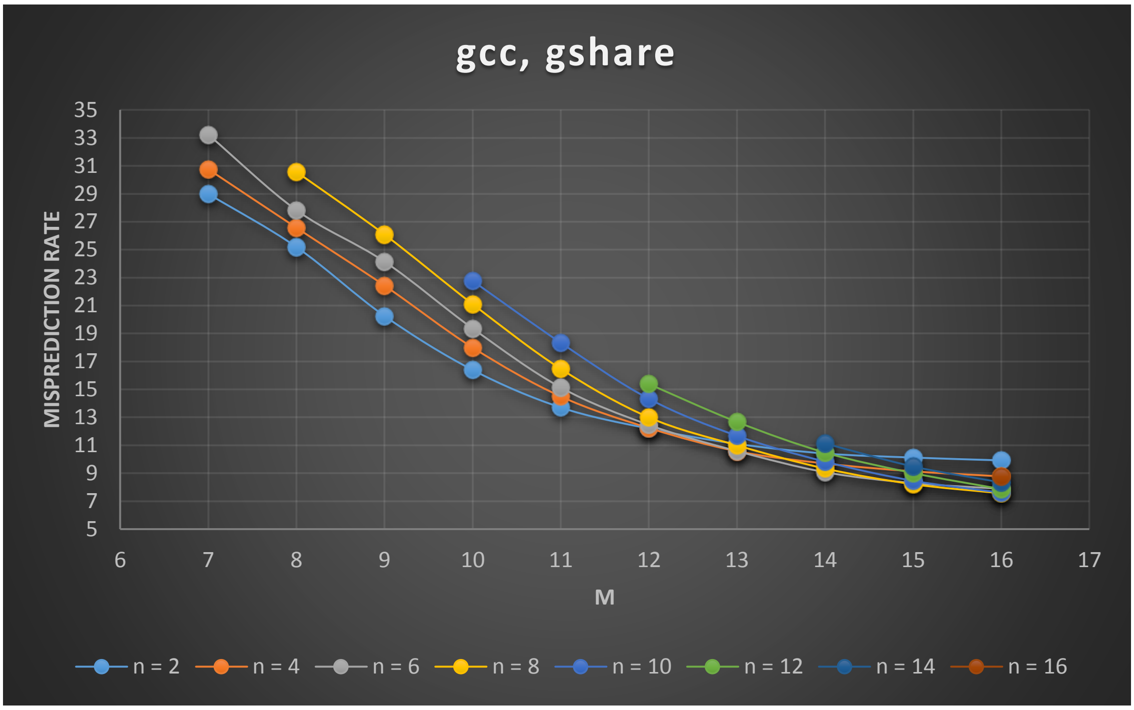


Analysis:

- The value of misprediction rate decreases for increase in the value of m for all three benchmarks, since as the number of bits in the index increases, the number of unique branches that can be accommodated in the bimodal predictor table increases, leading to les mispredictions.
- The difference in the misprediction rates for successive values of m is less in jpeg compared to perl and gcc benchmarks.
- The misprediction rate is maximum for gcc benchmark for different values of m compared to the otherc two benchmarks.
- The predictor performs the best for jpeg benchmark since mispredition rate for jpeg is less for different values of m compared to perl and gcc benchmarks.

Design:

For gcc benchmark,

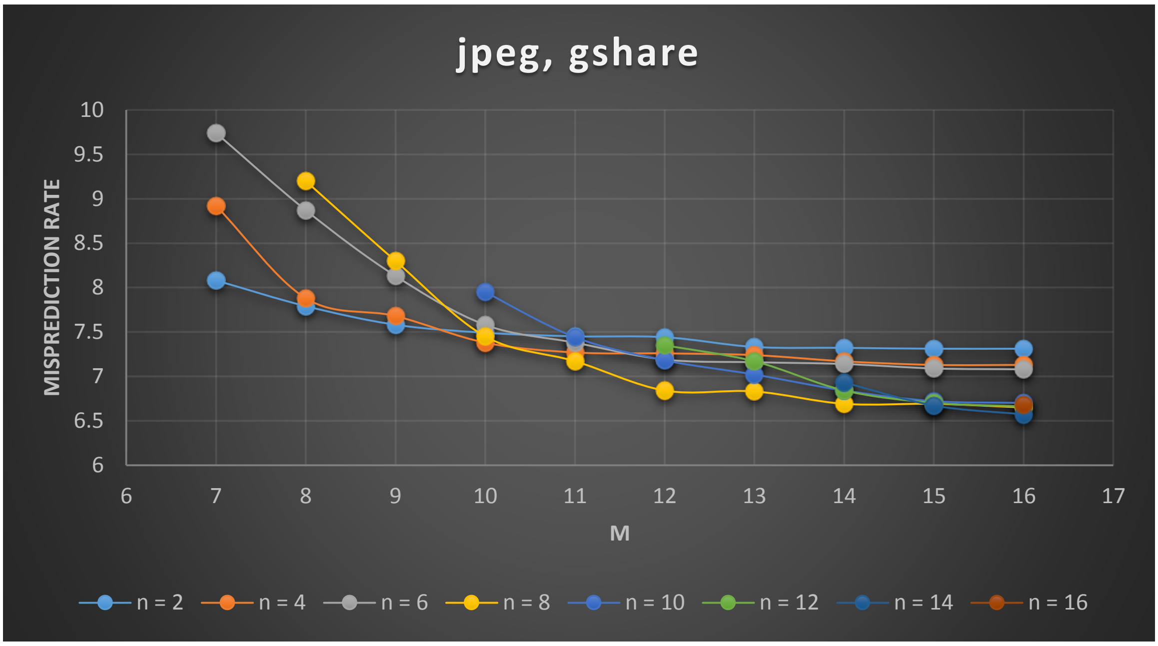


The design which minimizes the misprediction rate and predictor cost occurs for m=13 and n=2, since we observe diminishing returns in the misprediction rate for any increase in the value of m and n beyond m=13 and n=2. At m=13 and n=2,

Misprediction rate =**11.11%**

Predictor storage=**2KB**

For jpeg benchmark,

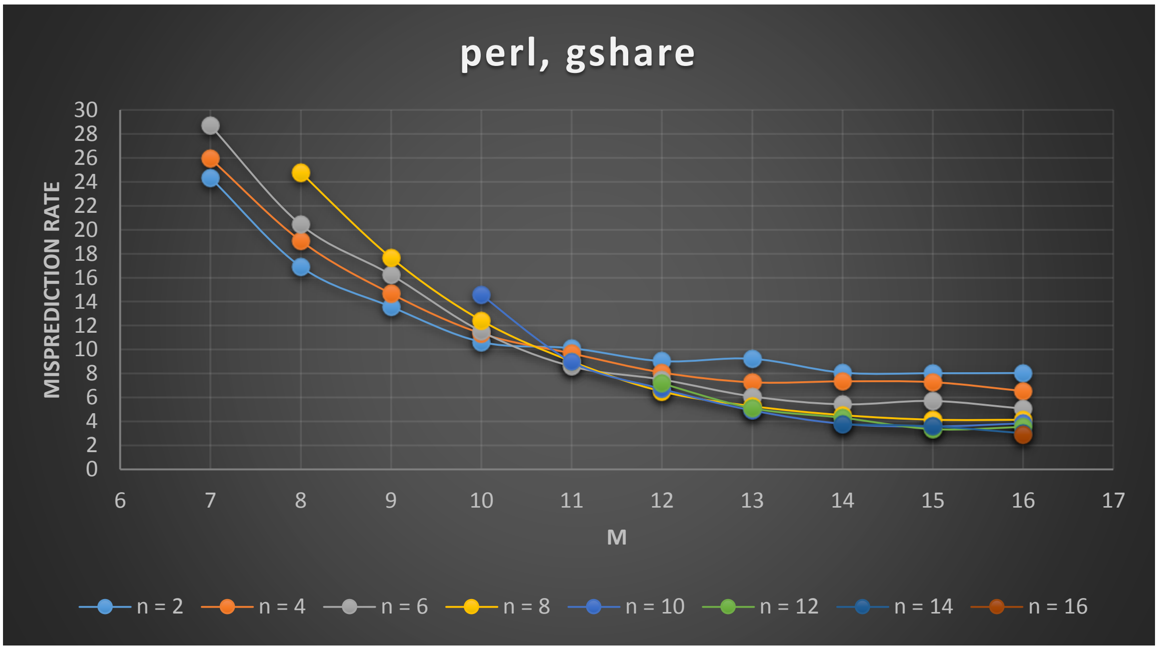


The design which minimizes the misprediction rate and predictor cost occurs for m=12 and n=6, since we observe diminishing returns in the misprediction rate for any increase in the value of m and n beyond m=12 and n=6. At m=12 and n=6,

Misprediction rate =**7.19%**

Predictor storage=**1KB**

For perl benchmark,



The design which minimizes the misprediction rate and predictor cost occurs for m=13 and n=8, since we observe diminishing returns in the misprediction rate for any increase in the value of m and n beyond m=13 and n=8. At m=13 and n=8,

Misprediction rate =**5.26%**

Predictor storage=**2KB**